

<Experimental report>

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<OBJECT>

An object of this experimental report is to investigate an effect of adding "multifunctional ethylenically unsaturated carboxylic acid ester" to a binder composition for an electrode for an electric double layer capacitor.

<EXPERIMENT>

Binder compositions are listed in Table-1 below showing a mass % of components therein.

(Table-1)

	Binder		
	No.1	No.2	No.3
n-Butyl acrylate	86	86	-
2-Ethylhexyl acrylate	-	-	80
Methacrylonitrile	12	12	15
Diethylene glycol dimethacrylate	2	-	-
Acrylic acid	-	2	8

The binder No.1 to No.3 are evaluated by "Swelling ratio to electrolytic solution" "Peel strength" "Initial discharge capacity" and "Discharge capacity after 100 hours at 70 degree C".

<RESULT>

The results are shown in Table-2 below.

(Table-2)

	No.1	No.2	No.3
Swelling ratio to electrolytic solution	1.3	2.0	1.7
Peel strength (N/cm)	0.15	0.17	0.18
Initial discharge capacity (mWh/g)	17.2	15.7	16.0
Discharge capacity after 100 hours at 70°C (mWh/g)	16.3	12.3	13.2

The binder of "YAMAKAWA et al" (No.2 and No.3) is comprising an ethylenically unsaturated carboxylic acid, but is not comprising multifunctional ethylenically unsaturated carboxylic acid ester. The binder of our invention (No.1) is comprising multifunctional ethylenically unsaturated carboxylic acid ester, but is not comprising an ethylenically unsaturated carboxylic acid.

Comparing our binder No.1 to binders No.2 and No.3 ("YAMAKAWA et al"), the binders No.2 and No.3 showed increase of peel strength, but swelling ratio to electrolytic solution was also increased, and the discharge capacities (Initial and after heat treatment) were significantly deteriorated.

<DISCUSSION>

Increased swelling ratio to electrolytic solution causes increased covering area on a surface of active carbon by the binder, or increased internal resistance of electrode, therefore the discharge capacities were made to be decreased. In our invention, our inventor, Yamakawa, believes that multifunctional ethylenically unsaturated carboxylic acid ester produces cross-linking structure in the binder, therefore the swelling of the binder in the electrolytic solution is suppressed, and deterioration of the discharge capacities is prevented.